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Carrier Ethernet

Carrier Ethernet is internationally renowned as a powerful and simple alternative to traditional IP and MPLS based VPN services. This is due to a number of reasons, which are further described below.

In private networks the IP configuration is under the complete control of the owner or operating entity. Due to different needs and preferences, private IP networks will usually be quite differently organised from one network to another. This includes choice of routing protocol amongst e.g. various BGP variants, OSPF or static routing. It also includes how the split between public and private IP addresses is handled. On top of that some private networks use MPLS for various purposes, and quite a few proprietary protocols are also around. All of these choices make every private IP network a bit different from the others.

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This means that when a public VPN service is used to connect distant sites to a private network, the IP configuration have to be carefully adapted in a number of ways to accommodate the public IP network between a distant site and the core network:

- **IP-addressing**

It is necessary to co-ordinate the use of IP addresses between a private network and a public network, because private networks usually use private IP addresses. These addresses have to be translated using NAT (Network Address Translation) before entering the public network. This makes the IP addressing plan and the network design more complex than it would be without the borders introduced by the IP VPN service.

- **Coverage**

It is in some cases necessary to use more than one IP VPN (IP Virtual Private Network) to cover the wanted area. This is because some IP VPN service providers do not provide full coverage of the entire network within one and the same VPN. This can be solved by using specific VLAN IDs to address specific VPNs (also termed 'VRF's, VPN Routing and Forwarding tables) to reach a certain area. Thus the private network administrator has to include handling of different VLANs in the IP forwarding mechanisms, making the network yet more complex.

- **Quality of Service (QoS)**

The standard QoS level offered by IP/MPLS services is usually not sufficient to handle e.g. IP Telephony. This is because IP/MPLS services are often based on overbooked networks - real time traffic is only supported at a non-standard QoS level, and within a limited percentage of the bandwidth.

Carrier Ethernet from GlobalConnect is based on a non-overbooked network, and the standard offered QoS level matches the highest achievable in the market. Traffic prioritisation for handling more than one service class per link is available with Carrier Ethernet as with IP/MPLS based services.

- **Security**

Private networks are used for transfer of vital information to the business and its customers. IP based VPNs are based on strong encryption to provide the necessary security. This is generally considered safe, however at higher speeds it introduces substantially higher equipment costs, as encryption requires much more processing power than standard IP packet forwarding does. Furthermore, encryption reduces the available bandwidth due to more data being transferred. Carrier Ethernet separates customer traffic in hardware at layer one or layer two, providing ultimate security while eliminating the need for encryption.

- **Complexity**

The overall complexity increases when interfacing at the IP level between a public VPN service and a private network. Therefore specialists are often required in the process of designing networks using public IP VPN services across geographical gaps. On the other hand, Carrier Ethernet closes the geographical gaps with out interfacing at the IP level. Carrier Ethernet behaves just like a standard LAN switch, being so commonly well known that it doesn't necessarily require specialists to design the network.

As outlined above, public IP VPN services will normally increase the complexity within a private IP network - and thereby also increase the operational costs. Time consuming procedures are necessary when IP-addresses, QoS levels and VRF details are co-ordinated with the service provider. This has been the reality as long as public VPN services have been around, and as such it doesn't raise anyone's eyebrows. The only way to avoid complex co-ordination has been to use leased lines, rent dark fibre, or to establish own fibre cables.

But it doesn't have to be like that.

Carrier Ethernet is a new kind of VPN service which provides the advantages and cost savings of using a public VPN service, but without the draw backs mentioned above. There

is no co-ordination to be handled, since the interface is as simple as can be, while still providing the same service possibilities. The network manager's time is freed from handling complex adaptations of the IP configuration for the sake of geographical coverage.

The result is a unified and elegant private network design, lowering the operational costs due to less time spent on network maintenance, and it optimises availability of common IT resources for the benefit of both the users and the Chief Financial Officer.

The main principle of Carrier Ethernet can be illustrated as shown in the figure below:

In short, Carrier Ethernet is fulfilling the wishes for a 'dream' interface towards a VPN -service provider:

- Standard Ethernet RJ-45 or fibre ports
- Transparent to all higher level protocols including IP
- Highest available QoS level in the market as standard
- Scalability from 10 Mbit/s to 10 Gbit/s when delivered over fibre
- Switching between network sites as in a standard Local Area Network (LAN)

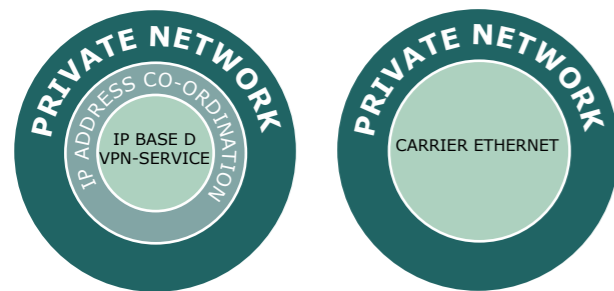


Figure 1
With Carrier Ethernet there is no need to co-ordinate the IP-configuration with 3rd party

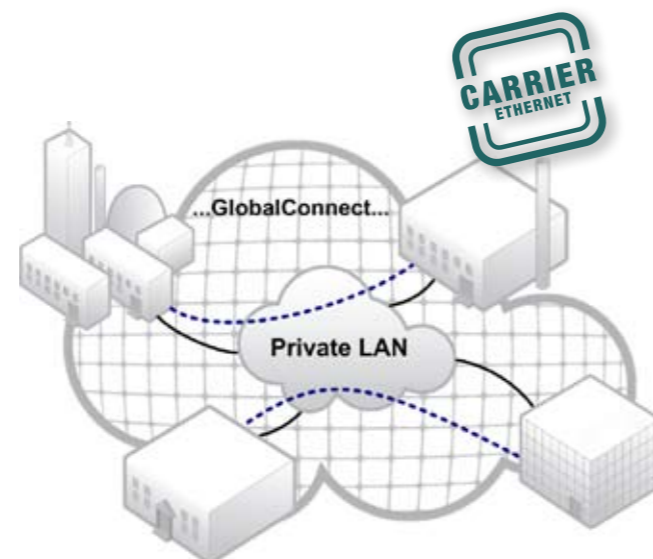


Figure 2
Carrier Ethernet provides any-to-any communication just like an ordinary LAN switch

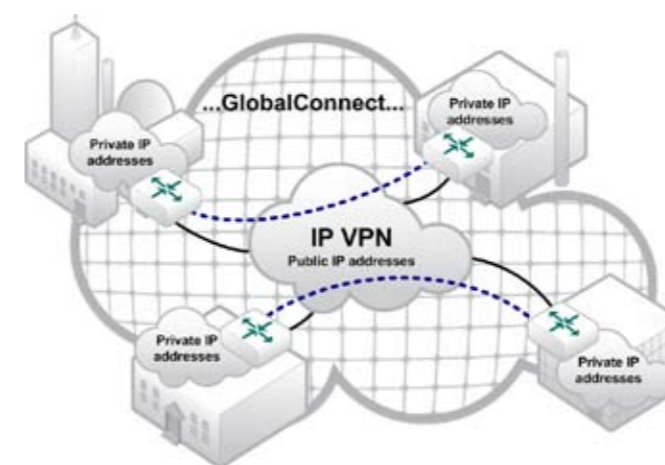


Figure 3
Standard IP VPN services requires use of several private IP address segments due to geography

	Carrier Ethernet	IP/MPLS based VPN	IP based VPN
Available on fibre and copper	✓	✓	✓
Scalability from 10 Mbit/s to 10 Gbit/s	✓	✓	✗
Any-to-Any connectivity	✓	✓	✓
Fully transparent to IP addressing plans	✓	✗	✓
Layer 3 network design independent of geography	✓	✗	✗
Full coverage within one VPN	✓	(✓)	(✓)
Support for non-standard layer 3 protocols	✓	✗	✗
QoS required for IP telephony is standard	✓	(✓)	✗
Real time services can utilise 100% of the available bandwidth	✓	✗	✗
Security is ensured in hardware, without costly encryption	✓	✓	✗
The VPN service can be fully utilised without expert skill level	✓	✗	✗
Availability of redundancy with automatic rerouting in case of fibre cuts	✓	✓	✓
Based on non-overbooked network	✓	✗	✗

(✓) = Not always

Table 1
Comparing Carrier Ethernet with IP MPLS and IP based VPN services